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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
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MCCRACKEN, DANIEL

ART UNIT	PAPER NUMBER
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1736

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/587,546	<b>Applicant(s)</b> BAI ET AL.	
	<b>Examiner</b> DANIEL C. MCCracken	<b>Art Unit</b> 1736	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2011.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 14-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 14-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

#### ***Status of Application***

The response dated 3/21/2011 has been received and will be entered. Claims 1-10 and 14-17 are pending. Claims 1-2, 4, 6, 10 and 17 are currently amended. Claims 11-13 are acknowledged as cancelled.

#### ***Response to Arguments***

##### **Claim Objections**

I. With respect to the objection to Claims 10 and 17 for various informalities, the remarks rely on the amendments, which corrected the errors. (Remarks of 3/21/2011 at 6). The objection is WITHDRAWN.

##### **Claim Rejections – 35 U.S.C. §112**

I. With respect to the rejection of Claims 1-10 and 12-17 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement, the traversal is on the grounds that:

Art Unit: 1736

[O]ne of ordinary skill in the art will appreciate from the present specification that the applicants were in possession of the claimed "composite reinforcement supports" as well as the previously claimed "supports". Specifically, for example, page 2, lines 16-23 of the specification describes composites of the disclosure which include nanotubes of the disclosure that constitute reinforcements on supports. The supports of the disclosure are further described as being nanoscale/microscale supports. See page 2, lines 29-31 of the specification.

The composites of the disclosure are further described, for example, at page 5, lines 8-11 and page 5, lines 13-15 of the specification. Page 5, lines 35-37 describes "The subject of the invention is also composites characterized in that they comprise CNTs bonded to nanoscale/microscale supports in a matrix."

(Remarks of 3/21/2011 at 6) (passage separated into paragraphs for purposes of discussion).

The rejection was based on the addition of "composite reinforcement" language in the amendment of 6/18/2010. This language serves as an adjective to modify the word "supports." The issue is whether there is 35 USC 112 "support" for a "nanotube support" that is a composite. It is respectfully submitted that there is not.

With respect to the first "paragraph" above addressing "supports," the passage at (S. 2: 16-23) is reproduced below:

To obtain more satisfactory composites from the requirements standpoint, the inventors have thus developed a technique, using the CVD method, of growing carbon nanotubes that constitute nanoscale reinforcements having optimized morphologies and bonding, on supports corresponding to microscale reinforcements.

(S. 2: 16-23). This passage does not state that the support is a composite. The passage at (S. 2: 29-31) is reproduced below:

The invention therefore provides a process for obtaining carbon nanotubes in situ in nanoscale/microscale supports.

(S. 2: 29-31). This passage does not state that the support is a composite.

Art Unit: 1736

With respect to the second “paragraph” above addressing composites, the passage at (S. 5: 8-11) is reproduced below:

The products obtained are characterized in that they are multiscale composites formed from carbon nanotubes bonded to nanoscale/microscale carbon fiber or ceramic fiber support materials, as defined above.

This does not state that the support (a carbon fiber or a ceramic fiber) is a composite, rather that the support forms a composite.

The passage at (S. 5: 13-15) is reproduced below:

These multiscale composites constitute reinforcements of great benefit for polymer, ceramic and metal matrices.

This passage does not state that the support is a composite.

The passage at (S. 5: 35-37) is reproduced below:

The subject of the invention is also composites characterized in that they comprise CNTs bonded to nanoscale/microscale supports in a matrix.

This passage does not state that the support is a composite. In sum, none of the passages cited recite that the supports are composites. Some dependent claims that further limit the supports are not composites while others are. *See e.g.* Claims 2-3. The Examiner recommends deleting the “composite reinforcement” language. While it might be construed as aspirational or intended use type language, it also suggests that the support is itself a composite, a feature which is not believed to be supported by the disclosure. The rejection is MAINTAINED.

**I.** With respect to the rejection of Claims 1-10 and 12-17 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, the traversal is on the grounds that “[t]he claims

Art Unit: 1736

are submitted to be definite.” (Remarks of 3/21/2011 at 7). No citation to the specification was provided per the office action. This is a general allegation of patentability in violation of 37 C.F.R. 1.111(b). No specific traversal was presented, and as such, it is presumed that the rejection is proper. The rejection is MAINTAINED.

#### Claim Rejections – 35 U.S.C. §102

I. With respect to the rejection of Claims 1-8 and 15 under 35 U.S.C. 102(b) as being anticipated by Singh, et al., *Towards the production of large-scale aligned carbon nanotubes*, Chemical Physics Letters 2003; 372: 860-865 (hereinafter “Singh at \_\_\_”) in view of US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, <http://www.accessscience.com>, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter “Heaney at \_\_\_”) to show a state of fact, the traversal is on the grounds that the rejection is obviated by amendment, specifically exclusion of the quartz particles. (Remarks of 3/21/2011 at 7). This is persuasive. The rejection is WITHDRAWN. New rejections appear *infra*.

#### Claim Rejections – 35 U.S.C. §103

I. With respect to the rejection of Claims 1-8 and 15-16 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 (hereinafter “Rao at \_\_\_”) in view of Ma, et al., Processing and properties of carbon nanotubes–nano-SiC ceramic, Journal of Materials Science 1998; 33: 5243-5246

Art Unit: 1736

(hereinafter “Ma II at \_\_\_”), the traversal is on the grounds that “[b]oth of the cited references lack at least a disclosure of contacting a nanometric and/or micrometric-sized reinforcement support with a mixture of carbon source compound and a catalyst.” (Remarks of 3/21/2011 at 8). This was addressed in the office action, where it was stated that “[o]ne would be motivated to grow nanotubes on SiC for any number of reasons, for example the elimination of the mixing step Ma II employs to make their ceramics/composites.” (Non-final Office Action dated 12/27/2010 at 12). This motivation, as well as that related to the resulting ceramics were not traversed and presumed correct. The rejection is MAINTAINED.

**II.** With respect to the rejection of Claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 as applied to claim 1 above, and further in view of US 2003/0119920 to Wang, et al., the traversal is on the grounds that “[Wang] . . . lacks at least a teaching or suggestions of contacting a nanometric and/or micrometric-sized reinforcement support with a mixture of carbon source compound and a catalyst.” (Remarks of 3/21/2011 at 9). A suggestion was articulated in the rejection related to incorporation into the structures suggested by Wang. This was not traversed. The rejection is MAINTAINED.

**III.** With respect to the rejection of Claims 9-10 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al.. as applied to claim 1 above, and further in view of Choi, et al., *Controlled deposition of carbon nanotubes on a patterned substrate*,

Art Unit: 1736

Surface Science 2000; 462: 195-202 (hereinafter “Choi at \_\_\_”), the traversal relies on the remarks presented in connection with obviousness Rejection II *supra*. (Remarks of 3/21/2011 at 9). No specific traversal of Choi was presented. *Id.* As such, the application of Choi is presumed correct. The rejection is MAINTAINED.

IV. With respect to the rejection of Claim 17 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al.. as applied to claim 1 above, and further in view of Xu, et al., *A method for fabricating large-area, patterned, carbon nanotube field emitters*, Applied Physics Letters 1999; 74(17): 2549-2551 (hereinafter “Xu at \_\_\_”), the traversal relies on the remarks presented in connection with obviousness Rejection II *supra*. (Remarks of 3/21/2011 at 9). No specific traversal of Xu was presented. *Id.* As such, the application of Xu is presumed correct. The rejection is MAINTAINED.

V. With respect to the rejection of Claim 12 under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., *Towards the production of large-scale aligned carbon nanotubes*, Chemical Physics Letters 2003; 372: 860-865, US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, <http://www.accessscience.com>, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter “Heaney at \_\_\_”), as applied to claim 1 above, and further in view of Andrews, et al., *Carbon nanotube polymer composites*, Current Opinion in Solid State and Materials Science 2004; 8: 31-37, the rejection is mooted by cancellation and WITHDRAWN.



**VI.** With respect to the rejection of Claims 1, 5 and 14-15 under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., *Towards the production of large-scale aligned carbon nanotubes*, Chemical Physics Letters 2003; 372: 860-865 in view of WO 00/17102 to Smalley, et al. and Maruyama, et al., *Low-temperature synthesis of high-purity single-walled carbon nanotubes from alcohol*, Chemical Physics Letters 2002; 360: 229-234 (hereinafter “Maruyama at \_\_\_”), the traversal is on the grounds that "Singh does not consider growing nanotubes on anything other than thin quartz flakes because it allows to increase [*sic*] the yield of the nanotubes." (Remarks of 3/21/2011 at 10). This is understood as relying on the amendments to exclude quartz/SiO<sub>2</sub> particles. This is persuasive. The rejection is WITHDRAWN.

**VII.** With respect to the rejection of Claims 1-4 and 13 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 in view of US 6,979,433 to Saito, et al., the traversal is on the grounds that “[t]here is no suggestion in Rao, or the combination of Rao and Saito, to have made the claimed invention.” (Remarks of 3/21/2011 at 10). This is a general allegation of patentability in violation of 37 C.F.R. 1.111(b). Presumably the remarks intended to argue the amendment to Claim 1 excluding wires comprising a metallic material. Because of this amendment, the rejection is WITHDRAWN.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

Art Unit: 1736

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

**I. Claims 1-10 and 14-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.**

The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The analysis for analyzing claims for compliance with the written description requirement is set forth in MPEP 2163 II. A., and is succinctly summarized as:

1. For Each Claim, Determine What the Claim as a Whole Covers
2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step
3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed.

The following findings are made in light of the analysis set forth in MPEP 2163 II. A.:

1. For Each Claim, Determine What the Claim as a Whole Covers.

Independent Claim 1 now recites “composite reinforcement.” These claims apparently cover some manner of making nanotubes and composites.

2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step.

The remarks filed 6/18/2010 called out paragraphs 6-18 of the US PGPUB versus the disclosure as originally filed. This would appear to correspond to (S. 2: 17 – 3: 24). This passage

Art Unit: 1736

has been reviewed and there does not appear to be support for growing nanotubes on “nanometric and/or micrometric-sized *composite reinforcement*.” The only mention of “composite” is in the context of later produced composites. *See* (S. 2: 33-35). The disclosure as filed does not provide for growing nanotubes on (or in the parlance of the claim “obtaining carbon nanotubes bound to”) composites. The disclosure refers to “support materials,” generally ceramics – *see* (S. 3: 26-31) – but not “composites.” This amendment broadens the scope of the claim and represents new matter.

3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed.

As the Specification appears directed towards growing nanotubes on a support versus on a “composite reinforcement supports,” one of skill in the art would not recognize Applicants had possession of the claimed invention. To the extent Applicants believe otherwise, they are respectfully requested to cite with particularity to the Specification as filed. This is in accordance with MPEP practice and would be helpful in withdrawing the rejection. *See* MPEP 714.02 (“Applicant should also specifically point out the support for any amendments made to the disclosure.”) All dependent claims not specifically addressed import the issues of the claims from which they depend.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**I. Claims 1-10 and 14-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

The “composite reinforcement supports” language present in independent Claim 1 is not understood. As discussed above, the “composite reinforcement supports” language does not appear to be supported by the disclosure and as such, it is impossible to ascribe a meaning to it. All dependent claims not specifically addressed import the issues of the claims from which they depend. To the extent Applicants believe otherwise, they are respectfully requested to cite with particularity to the Specification as filed, per MPEP practice.

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**I. Claims 1-8 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., *Towards the production of large-scale aligned carbon nanotubes*, Chemical Physics Letters 2003; 372: 860-865 (hereinafter “Singh at \_\_”) in view of**

**(i) Ma, et al., *Processing and properties of carbon nanotubes–nano-SiC ceramic*, Journal of Materials Science 1998; 33: 5243-5246 (hereinafter “Ma II at \_\_”), and**

**(ii) US 2003/0119920 to Wang, et al.**

With respect to Claim 1, and notwithstanding the ambiguities associated with this claim, this claim requires “contacting the supports with a mixture of a carbon source compound and a catalyst\_in a stream of inert gas and hydrogen, the step of contacting being effected by chemical vapor deposition (CVD).” Singh teaches a process for growing nanotubes on supports. These supports are contacted with a carbon source and a catalyst in an inert/hydrogen stream. (Singh at

Art Unit: 1736

861, col. 1) (ferrocene/toluene). The reaction is carried out in the vapor phase, *i.e.* it is a “CVD” process. *Id.*

Claim 1 further requires “wherein said at least one of said supports are not SiO<sub>2</sub> particles or wires comprising a metallic material.” Singh teaches SiO<sub>2</sub> or quartz particles. (Singh at 861, col. 2). This difference does not impart patentability. Other supports are known in the art and useful for making nanotubes. The Examiner takes official notice that they are. In support of taking official notice, *i.e.* in making sure there is “substantial evidence” on the record, the Examiner provides the following:

(i) Ma II teaches that SiC coupled with carbon nanotubes might improve the brittleness of ceramics. (Ma II at 5243). One would be motivated to grow nanotubes on SiC for any number of reasons, for example the elimination of the mixing step Ma II employs to make their ceramics/composites. Note that the sizes are suggested. (Ma II at 5243, col. 2). To the extent they aren’t changes in size do not impart patentability. MPEP 2144.04 IV.

(ii) (Wang 3: [0042]).

Substitution of these supports for those of Singh reflects substitution of known elements for one another, application of known techniques to improve similar methods, and/or combination of prior art elements to known methods to achieve predictable results. This does not impart patentability. MPEP 2143.

As to Claim 2, a temperature of 700-760 °C is taught. Note that Singh also discloses characterization of the product with a scanning electron microscope, suggesting that the product was cooled to room temperature.

As to Claims 3-4, see discussion of Ma II and Wang above.

As to Claims 5 and 15, toluene is a liquid hydrocarbon

Art Unit: 1736

As to Claim 6, ferrocene (an iron metallocene) is taught. (Singh at 861, col. 1).

As to Claim 7, a solution of 2-9.6 wt% ferrocene is taught. (Singh at 861, col. 1).

As to Claim 8, a 10% inert/hydrogen mixture is taught. *Id.*

**II. Claims 1-8 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 (hereinafter “Rao at \_\_\_”) in view of Ma, et al., *Processing and properties of carbon nanotubes–nano-SiC ceramic*, Journal of Materials Science 1998; 33: 5243-5246 (hereinafter “Ma II at \_\_\_”).**

With respect to Claim 1, Rao teaches a CVD method for growing carbon nanotubes. *See generally* (Rao at 129 *et seq.*) (“Experimental”). Rao teaches argon (*i.e.* an inert), hydrogen, and benzene (*i.e.* a carbon source). *See e.g.* (Rao at 129) (“Fig.”). A metallocene catalyst is recited. *Id.* The catalyst is vaporized (Rao at 132, col. 1) and passed with the carbon source into the second furnace where the nanotubes are deposited. *Id.* To the extent Rao *may* not teach the substrate/support (*i.e.* “ceramic material”) required by the claims (Claims 1-4), this does not impart patentability. Ma II teaches that SiC coupled with carbon nanotubes might improve the brittleness of ceramics. (Ma II at 5243). One would be motivated to grow nanotubes on SiC for any number of reasons, for example the elimination of the mixing step Ma II employs to make their ceramics/composites. Note that the sizes are suggested. (Ma II at 5243, col. 2). To the extent they aren’t changes in size do not impart patentability. MPEP 2144.04 IV.

As to Claim 2, temperatures of 1173 and 1373 K (*i.e.* approx 900 and 1100 C) are taught. (Rao at 130). Recovery details are taught at (Rao at 132, col. 1) (sonication). To the extent Rao doesn’t recite *in haec verba* “cooling to room temperature,” it is expected that this step necessarily occurs, as evidenced by the micrographs. Stated differently, it is highly unlikely that

Art Unit: 1736

1100 C nanotubes were placed in a microscope. Note also the “cold trap” shown in the apparatus. (Rao at 129) (“Fig. 1a-c”). This is the evidence offered to show inherency.

As to Claim 5 and 15, benzene is taught. (Rao at 129).

As to Claims 6 and 16, ferrocene and iron pentacarbonyl are taught. *Id.*

As to Claim 7, the ratios appear to be taught. (Rao at 132, col. 1). To the extent they are not, it is axiomatic that the amount of catalyst necessarily effects the rate of reaction, conversion, etc., and is readily optimized. Note also the discussion at (Rao at 133, col. 2) suggesting controlling the relative amounts.

As to Claim 8, note the ratios taught at (Rao at 132, col. 1).

**III. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 as applied to claim 1 above, and further in view of US 2003/0119920 to Wang, et al.**

The preceding discussion of Rao is expressly incorporated herein by reference. With respect to supports of Claims 1-4 – to the extent they are not taught by Rao, they are disclosed by Wang. *See* (Wang 3: [0042]). Growth of the nanotubes on the supports taught by Wang would allow for incorporation into the structures suggested by Wang. *See* (Wang 3: [0043] *et seq.*). Changes in size do not impart patentability. MPEP 2144.04 IV.

**IV. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al., as applied to claim 1 above, and further in view of Choi, et al., *Controlled deposition of carbon nanotubes on a patterned substrate*, Surface Science 2000; 462: 195-202 (hereinafter “Choi at \_\_\_”).**

Art Unit: 1736

The preceding discussion of Rao and Wang is expressly incorporated herein by reference. To the extent Claims 9-10 require the coating of the support with a silane, and to the extent neither Rao or Wang discloses such a step, Choi does. *See* (Choi at 196-197). One would be motivated to apply a silane, as it provides for selective deposition of the nanotubes on the substrate. *Id.*

**V. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., *Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors*, Mat Res Innovat 1998; 2: 128-141 and US 2003/0119920 to Wang, et al. as applied to claim 1 above, and further in view of Xu, et al., *A method for fabricating large-area, patterned, carbon nanotube field emitters*, Applied Physics Letters 1999; 74(17): 2549-2551 (hereinafter “Xu at \_\_\_”).**

The preceding discussion of Rao and Wang is expressly incorporated herein by reference. To the extent Claim 17 require coating a substrate with SiC, and to the extent neither Rao or Wang discloses such a step, Xu does. *See* (Xu at 2549). One would be motivated to coat the substrate with silicon carbide, as it can act as a barrier layer to prevent reactions. *Id.*

**VI. Claims 1, 5 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., *Towards the production of large-scale aligned carbon nanotubes*, Chemical Physics Letters 2003; 372: 860-865 in view of**

**(i) Ma, et al., *Processing and properties of carbon nanotubes-nano-SiC ceramic*, Journal of Materials Science 1998; 33: 5243-5246 (hereinafter “Ma II at \_\_\_”), and**

**(ii) US 2003/0119920 to Wang, et al., and further in view of:**

**(iii) WO 00/17102 to Smalley, et al. and Maruyama, et al., *Low-temperature synthesis of high-purity single-walled carbon nanotubes from alcohol*, Chemical Physics Letters 2002; 360: 229-234 (hereinafter “Maruyama at \_\_\_”).**

The discussion of Claims 1 and 5 accompanying the obviousness rejection (“Rejection I”) *supra* is expressly incorporated herein by reference. To the extent Singh does not employ an



Art Unit: 1736

alcohol as the carbon source, this does not impart patentability. Use of alcohols as carbon sources in nanotube synthesis schemes is old and known, and the Examiner takes official notice that it is. In support of taking official notice (*i.e.* in making sure there is substantial evidence on the record), the Examiner provides:

1. WO 00/17102 to Smalley – *see* (Smalley 10: 15-20) (“Suitable carbon-containing compounds include . . . oxygen-containing hydrocarbons, e.g., formaldehyde, acetaldehyde, acetone, methanol, ethanol, or mixtures thereof.”).
2. Maruyama – *see e.g.* (Maruyama “Abstract”) (“By using alcohol as the carbon source, a new simple catalytic chemical vapor deposition technique to synthesize highpurity single-walled carbon nanotubes at low temperature is demonstrated.”).

Use of this known carbon source in a known method is an obvious expedient owing to any number of advantages/motivations, etc., for example the decreased amorphous carbon, etc. *See e.g.* (Maruyama “Abstract”).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

Art Unit: 1736

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/  
Daniel C. McCracken  
Primary Examiner, Art Unit 1736  
DCM